UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

MEMORANDUM

SUBJECT: Engineering Evaluation/Cost Analysis Approval Memorandum for a Proposed Non-Time Critical Removal Action at Segments 6 & 7 of the Tittabawassee River, Saginaw River & Bay Site, Michigan

FROM: Mary P. Logan, Remedial Project Manager

THRU: Scott Hansen, Acting Chief SKH
Remedial Response Section 5

Joan Tanaka, Chief SKH for J.T.
Remedial Response Branch 1

TO: Margaret Guerriero, Acting Director
Superfund Division

The purpose of this memorandum is to request approval to proceed with an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time critical removal action (NTCRA) to address dioxin-contaminated riverbanks and in-channel sediment at Segments 6 & 7 within the Tittabawassee River, Saginaw River & Bay Site, Michigan (Site). The United States Environmental Protection Agency (EPA) will direct the Dow Chemical Company (Dow) to prepare the EE/CA, and expects Dow to design and implement the selected removal activities with EPA oversight. EPA has consulted, and will continue to consult with, the Michigan Department of Environmental Quality (MDEQ) on Segments 6 & 7.

According to Directive 9360.0-19, from the Office of Solid Waste and Emergency Response (OSWER), March 3, 1989, EPA Headquarters consultation must occur prior to conducting removal actions at sites that are not listed on the National Priorities List where taking that removal action may be nationally significant or precedent-setting. That Directive at Section I.3 identifies as nationally significant or precedent-setting *"[r]emoval actions at sites involving any form of dioxin when it is one of the principal contaminants of concern. Rationale: HQ concurrence will ensure national consistency in dioxin cleanup."* Further, the OSWER memorandum dated December 13, 1996, titled "Headquarters Consultation for Dioxin Sites," requests that the Regions consult with Headquarters where remediation goals are to be developed for dioxins in soil. Remediation goals for dioxins in soil and/or sediment will not be developed as part of this EE/CA, the response will be performance-based. Because dioxins are principal

contaminants of concern, Region 5 will consult with Headquarters prior to signing any NTCRA Action Memorandum for Segments 6 & 7.

I. Background

1. Site and Segments 6 & 7 Background

Dioxins (primarily furans) are found in and along the Tittabawassee and Saginaw Rivers and in Saginaw Bay from past waste disposal practices at Dow's plant in Midland, Michigan. Contamination extends over 50 miles downstream of the Dow Midland facility. The term "dioxins" refers to a large family of similar chemicals, including furans. EPA has concluded that dioxins may cause cancer or other health effects such as skin problems, liver damage, and reproductive issues, depending on exposures. Dioxin concentrations are generally discussed as toxic equivalency (TEQ) – a calculation summing the relative toxicity of the congeners as compared to 2,3,7,8-tetrachlorodibenzo-p-dioxin.

Dow's Midland plant began operations in 1897 and eventually grew to be a 1,900-acre facility. One major historical process used at the Midland plant was the chloralkali process, which used electric current to extract chemicals from brine. Early in the history of the Midland plant, wastes were discharged directly into the Tittabawassee River and, later, wastes were stored and partially treated in settling ponds prior to discharge to the river. Much of the TEQ in Segments 6 & 7 is believed to have been released in the early 1900s in the form of furan-contaminated graphitic particles that came from breakdown of carbon anodes used in the chloralkali process. Once released to the river, the graphitic particles mixed with the sediment and deposited in levees that form the riverbanks. Frequent flooding resulted in deposition of contaminated sediment in the floodplain. Over time, changes in waste management practices included the installation and operation of a modern wastewater treatment plant. Waste management practices at the Midland plant, including the wastewater treatment plant and surface water control, have reduced or eliminated non-permitted releases from the Midland plant.

The Site starts at the confluence of the Tittabawassee and Chippewa Rivers, at a local landmark, the Tridge. Segments 6 & 7 are the last two of seven segments in the Tittabawassee River (see Figure 1). The Site is being addressed in a general upstream to downstream approach beginning with Segment 1, which consists of a 3.1-mile stretch of the Tittabawassee River that transects the Midland plant. Segment 2 is the river stretch beginning immediately downstream of Segment 1 and extending approximately 4.1 miles. Segment 3 is about 4.2 miles long and is located within Tittabawassee Township and the unincorporated community of Freeland. Segment 4 is 3.4 miles long and is located within Tittabawassee, Thomas and Saginaw Townships. Segment 5 begins upstream of Imerman Park and extends approximately 2.7 miles.

Discreet deposit areas within the Site, designated as Sediment Management Areas (SMAs) and Bank Management Areas (BMAs) have been the focus of the cleanups in Segments 1 through 5. SMAs are identified because these sediment deposits contain contiguous higher levels of TEQ that could erode under certain flow conditions. BMAs are identified as those banks that are currently the least stable and that could be a significant source of TEQ to the river if they erode. Segment 1 did not have BMAs, and sediment cleanup was conducted in 2012 and 2013.

Segment 1 SMAs contained other contaminants of concern, not dioxin. Segment 2 sediment and bank construction work occurred in 2014 and 2015. SMA and BMA construction work in Segment 3 occurred in 2016. Segment 4 & 5 construction is planned for 2017 and 2018.

Segment 6 begins at State Road and extends approximately 3 miles from Reach NN[1] through Reach SS. This segment is located in Thomas, James, and Saginaw Townships. Segment 7 begins at the railroad bridge on the upstream side of West Michigan Park and extends approximately 3.7 miles to the downstream end of Green Point Island at the confluence of the Saginaw and Tittabawassee Rivers. Segment 7 includes reaches TT through YY, is located within James and Saginaw Townships, and includes portions of the Shiawassee National Wildlife Refuge.

2. Enforcement Background

From 2007 through 2009, high TEQ levels led to six Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) settlement agreements with Dow for time critical removal actions for sediment and soil within the Tittabawassee and Saginaw rivers and floodplains. These six removal actions are complete, other than maintenance and monitoring.

Negotiations with Dow began in December 2008 for a more comprehensive approach to address contamination in the rivers and Bay related to Dow's Midland plant. EPA management was involved at the Administrator level, and committed to a federal leadership role in expediting the cleanup of the Site. Additionally, EPA committed to a very high level of transparency during the negotiations, enhanced community involvement opportunities, and an accelerated schedule. Effective on January 21, 2010, EPA signed a CERCLA Administrative Settlement Agreement and Order on Consent (AOC) with MDEQ and Dow (Docket No. V-W-10-C-942), and work under the AOC is ongoing.

The AOC and its attached Statement of Work (SOW) set forth requirements for Dow to conduct evaluations of current conditions and assessments of response options to protect human health and the environment at the Site. Task 8 of the SOW describes the development of sequential upstream-to-downstream Segment-Specific Response Proposals for the Site beginning with the most upstream segment, Segment 1. As discussed in SOW Task 8.4.2 – Response Process, EPA's removal and/or remedial program authorities under CERCLA, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 C.F.R. Part 300), as amended, will be used to develop the Segment-Specific Response Proposals. As directed by EPA, Dow shall submit either a Feasibility Study (FS) or an EE/CA analysis consistent with the AOC for each Segment.

As a result of assessments conducted under the AOC, seven CERCLA settlement agreements for NTCRAs have been negotiated at the Site, and Dow is conducting or has conducted response

[1] River reaches refer to shorter sections of the Tittabawassee River than segments. Reaches were delineated as part of the geomorphological characterization of the river. Reaches begin with Reach A at the upstream end of Segment 1 and end in Reach YY at the downstream end of Segment 7.

actions in and along Tittabawassee River to address contaminants in sediment and soil. Four of these NTCRAs are substantially complete, other than operation, monitoring, maintenance, and in some cases institutional controls. These projects include: removal of a small eroding island in river reach MM; interim exposure controls at eligible residential properties along the Tittabawassee; cleanup of SMAs in Segment 1; and cleanup of SMAs and BMAs in Segment 2. Cleanup of SMAs and BMAs in Segment 3 occurred in 2016, and stability of the BMAs will be assessed in 2017, after the expected spring high water event(s). Segment 4 & 5 construction is planned for 2017 and 2018. Cleanup of the Tittabawassee River floodplain is an ongoing multi-year project that started in 2015, and is expected to continue through 2020.

II. Threat to Public Health, Welfare, or the Environment

In order for EPA to make a determination that a removal action is warranted, there must be an actual or potential unacceptable risk to human health or the environment from the release or potential release of hazardous substances, pollutants or contaminants. EPA will formally document this determination in the NTCRA Action Memorandum (issued after development of, and public comment on the EE/CA).

Under work previously conducted under the Resource Conservation and Recovery Act (RCRA) License issued to Dow by the State of Michigan, hundreds of in-channel sediment and bank soil samples have been analyzed from Segments 6 & 7. Supplemental focused sampling and analysis has been performed under the SOW to augment the Segment 6 & 7 site characterization. As shown through this sampling, dioxins/furans have been detected in Segment 6 & 7 sediment and bank soil at some locations (potential SMAs and BMAs) at concentrations that may pose a potential risk to human health or the environment.

For Segments 6 & 7, enough information is available from these prior investigations to support the appropriateness of the removal process to address conditions in Segments 6 & 7. There are some areas of Segments 6 & 7 with elevated TEQ that may be vulnerable to resuspension and/or erosion and release. The Tittabawassee River is often subjected to extreme weather conditions, typically in the winter and spring, which enhance the threat of a release. Heavy rains and storms increase stream volume and current velocity, which can contribute to erosion.

As weather conditions cause erosion, dioxins may be brought to the surface or spread to other downstream locations within the floodplain and river channel and may be deposited in locations where people and/or wildlife may come into contact with the contaminants. Human access to Segments 6 & 7 is available to people approaching Segments 6 & 7 from the Tittabawassee River, from West Michigan Park or the Shiawassee National Wildlife Refuge, or across privately owned riverside properties. Wildlife in the area also has access to Segments 6 & 7. Dioxins in surface sediment can bioaccumulate in fish. There are dioxin-based fish consumption advisories on the Tittabawassee and Saginaw rivers and Saginaw Bay.

As part of the EE/CA to be prepared for the Segments 6 & 7 Response Proposal, further evaluations of potential human health and ecological exposures in Segments 6 & 7 will be performed, consistent with direction provided by EPA under the AOC.

III. Factors for Determining Appropriateness of a Removal Action

Section 300.415(b)(2) of the NCP provides factors for determining the appropriateness of a removal action. The factor most applicable to current conditions at Segments 6 & 7 is the high levels of hazardous substances or pollutants or contaminants in bank soil and in-channel sediment largely at or near the surface that may migrate. Other applicable factors include: weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released (e.g., periodic flooding events); and actual or potential exposure to the food chain from hazardous substances or pollutants or contaminants (e.g., consumers of fish).

IV. Determining the Appropriateness of the NTCRA Process

Consistent with the SOW requirements, and following EPA's September 28, 2016, request to initiate the Segments 6 & 7 Response Proposal, a series of scoping meetings with EPA, MDEQ, and Dow occurred in late 2016 and early 2017. During the scoping meetings, the general requirements of the Segments 6 & 7 Response Proposal were discussed, and the site conditions and characterization data available for Segments 6 & 7 were broadly summarized.

Criteria established in *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, OSWER 9360.0-32, August 1993, and *Use of Non-Time Critical Removal Authority in Superfund Response Actions*, OSWER 9360.0-40P, February 2000, and other considerations were evaluated relative to the conditions in Segments 6 & 7. As EPA's guidance outlines, it has been a central feature of EPA's Superfund program philosophy to integrate the removal and remedial programs in order to achieve the greatest human health and environmental protection in the most efficient fashion. To this end, Superfund decision makers have been urged to broadly use the CERCLA removal authority to achieve timely and protective results. However, due to process and statutory differences between the requirements for removal actions and remedial actions, the determination of which program is most applicable for a site is made by EPA on a case-by-case basis, considering the following site-specific factors (OSWER 9360.0-40P):

1. Whether there is an actual or potential threat to human health or the environment from a release or threatened release of a hazardous substance, pollutant, or contaminant;
2. The time-sensitivity of the response; and,
3. The complexity and comprehensiveness of the likely action(s).

Each of these factors is discussed below.

1. Actual or potential threat to human health or the environment from a release or threatened release of a hazardous substance, pollutant, or contaminant

As discussed in Sections II, III, and V, there are releases and threatened releases of dioxins/furans within and from areas in Segments 6 & 7 that pose an actual or potential threat to human health or the environment. High levels of dioxins/furans in bank soil and in-channel sediment largely at or near the surface may be exposed or released, resulting in potential direct contact exposures or food chain bioaccumulation.

2. **Time-sensitivity of the response**

In accordance with § 300.415(b)(4) of the NCP, EPA's implementing regulations for CERCLA, EPA has determined that a planning period of at least six months exists before on-site activities could be initiated. The determination that a six-month planning period is available is based on analysis of the time-sensitivity and complexity of the potential response actions for Segments 6 & 7.

Typically, spring flooding of the Tittabawassee River occurs that can contribute to erosion of some contaminated bank soil and sediment in Segments 6 & 7, potentially resulting in the exposure or release of high levels of dioxins/furans. Historical erosion or release may have resulted in direct contact exposures or food chain bioaccumulation. Additional flooding events are likely and, therefore, it is time-sensitive that response actions targeting the most contaminated areas in Segments 6 & 7 occur to prevent future releases.

The Site is being addressed in a general upstream to downstream approach. In an EE/CA Approval Memorandum, signed on July 10, 2013, EPA determined that the Tittabawassee floodplain cleanup is time-sensitive. Cleanup of the floodplain is somewhat dependent on completion of the adjacent and upstream in-channel work to avoid recontamination of the floodplain, therefore, also making the cleanup of bank soils and sediments time-sensitive. A delay in addressing Segment 6 & 7 could result in delays in floodplain cleanup work.

Additionally, the Saginaw River and Bay are part of the Site. These downstream areas are expected to follow the remedial process. In 2002, EPA released *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites* (OSWER Directive 9285.6-08). EPA issued another document in 2005, the *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (Directive 9355.0-85). Both of these guidance documents emphasize the importance of source control before fully characterizing or remediating a site. Control of contaminated erosional areas in the Tittabawassee River contributes to source control for the Saginaw River and Bay.

The factors for determining the appropriateness of a Removal Action, discussed above, indicated that the Segments 6 & 7 response action is time-sensitive. However, the nature of the risks identified to date, the work already completed or underway upstream, and the need for careful planning for response actions do not indicate the need for a time critical response action in Segments 6 & 7.

3. **Complexity and comprehensiveness of the likely action(s)**

EPA anticipates that there will be specific SMAs and BMAs identified in Segments 6 & 7. Dow has successfully performed a range of bank and sediment removal, sediment capping, and bank stabilization work as response actions in other areas of the Site. The range of cleanup options to be evaluated in the Response Proposal will be specific to the conditions in Segments 6 & 7. However, the options are anticipated to have many elements common to other earlier actions taken at the Site which were successfully implemented. In particular, a

considerable amount of in-channel sediment and bank work has occurred, or will occur in Segments 1 through 5, through a combination of CERCLA removal actions, pilot studies, and RCRA interim response activities. The response actions to be evaluated in the EE/CA are anticipated to address source materials for the Segments 6 & 7 SMAs and BMAs, but not necessarily more complex than these prior actions.

Any response actions in Segments 6 & 7 conducted through a NTCRA are anticipated to be consistent with any likely response actions (including remedial actions) that may be selected in the future. Based on site-specific experience and also based on a review of sediment and bank cleanup remedies implemented at other sites with similar characteristics, prospective response options in Segments 6 & 7 are anticipated to be implementable, but will require careful planning prior to construction.

Based on a review of EPA's guidance, the NCP, and conditions in Segments 6 & 7, and upon approval of this EE/CA Approval Memorandum, EPA, in consultation with MDEQ, pursuant to Task 8.4.2 of the SOW, will direct Dow to use the NTCRA process to develop an EE/CA to develop mitigation measures to reduce exposures to and transport of contaminated media for the purposes of helping to control sources and contributing to acceptable levels of human health and ecological risks for Segments 6 & 7.

V. Statutory Basis for Action

The information presented in this memorandum and the Administrative Record indicates that actual or threatened releases of hazardous substances, pollutants, or contaminants from Segments 6 & 7 may present an imminent and substantial endangerment to public health or the environment.

VI. Enforcement/Proposed Actions/Cost Estimates

EPA, MDEQ, and Dow entered into the AOC which requires Dow to complete an EE/CA or FS for Segments 6 & 7 of the Site, and to design any response action selected by EPA, in consultation with MDEQ. At this time, EPA expects that Dow will enter a separate settlement agreement to implement selected removal activities for Segments 6 & 7.

With approval of this memorandum, an EE/CA will be developed and finalized, and information generated will be used to establish the scope of the proposed actions and cost estimates. EPA anticipates that some of the potential removal response options may include the following: sediment dredging/excavation; sediment capping; monitored natural recovery; bank stabilization; bank removal; institutional controls; or a combination of approaches. EPA cannot estimate the cost of the potential removal response options until the scope of work is determined. However, actual or estimated costs for previous in-channel sediment and bank removal responses conducted by Dow at the Site ranged from about $500,000 to $5,700,000.

EPA's guidance (OSWER 9360.0-40P) states: *"For non-time-critical removal actions where the cost of the selected removal action could exceed $6 million, the Region must consult with the Director of OERR prior to signing the EE/CA Approval Memorandum (or its equivalent). This*

consultation requirement applies both to fund-lead actions and those actions to be performed by PRPs." Region 5 does not expect that the cost of the NTCRA for Segments 6 & 7 will exceed $6,000,000.

VII. Public Involvement

EPA expects to issue an EE/CA for public comment in mid-2018.

VIII. Environmental Justice Analysis

To identify potential Environmental Justice (EJ) areas of concern, Region 5 uses available environmental and demographic information to highlight locations where additional review (e.g., information collection or analysis) may be warranted. EJ screening results in a preliminary characterization of potential impacts on the population, including low income and/or minority populations, and potential environmental and health impacts that may fall disproportionately on them. EPA will evaluate potential EJ concern in Segments 6 & 7 as part of the preparation of the NTCRA Action Memorandum.

IX. Approval/Disapproval

The conditions at Segments 6 & 7 of the Tittabawassee River/Saginaw River & Bay Site meet the NCP criteria for a removal action. Therefore, I am requesting approval to proceed with an EE/CA. Your approval or disapproval should be indicated below.

Approve: _____ Date: 3/20/2017
for Director, Superfund Division

Disapprove: _____ Date: _____
Director, Superfund Division

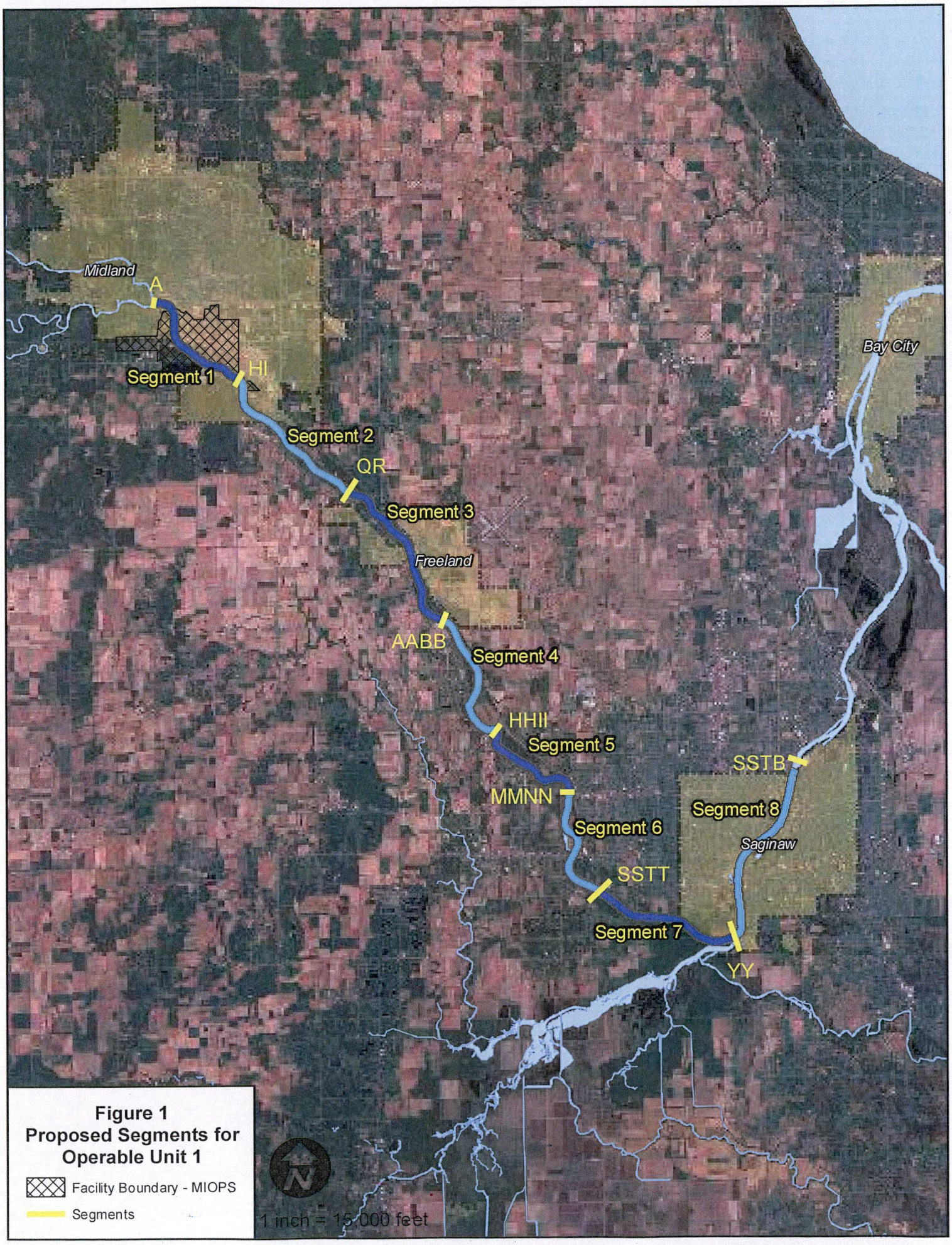

Figure 1
Proposed Segments for Operable Unit 1

Facility Boundary - MIOPS

Segments